Restorative Materials

Expanded Functions Training Lecture

Naval Dental Center, Pearl Harbor

Materials we use…

- Amalgam
- composite resins
- cements
- porcelains
- RMGI,GI
- DBA’s
- fluorides
- acrylics
- bleach
- Gypsum
- impression materials
- metals
- waxes

Amalgam

What's in it?

- Hg-mercury-dissolves solids, activates the reaction recombining the elements to make an alloy
- Ag- silver-reacts with Hg to form matrix; strength
- Sn-tin-low expansion but decreases strength
- Cu- copper- strength and hardness
- Zn-zinc- eliminates corrosion

Amalgam

- Admixed or Dispersed Phase
  - "sticks and balls"
  - mixture of lathe-cut and spherical
  - greater condensation force required
  - easiest to obtain contact in Class 2 preps
  - examples: Dispersalloy®, Valiant PhD ®

Amalgam

- Spherical
  - "ball bearings"
  - easiest to condense, use largest condenser
  - "best" sealing margins
  - problematic in achieving tight contacts
  - examples: Tytin®, Valiant®

Can you mix different amalgams in the same fill?

Yes!

- Large Build-ups are a good reason to mix amalgams
  - Start with fast set spherical for excellent marginal adaption and to allow timely removal of the matrix band, and
  - End with slow set admix to achieve tight contacts and allow time to carve

Amalgamation/ Trituration

Why is my amalgam too dry?

- Time: admix mixes more quickly than spherical
  - Under Triturated
    - Grainy & Dull
    - sticks to the capsule
  - Over Triturated
    - hot & crumbly
    - increases setting contraction, creep & decreases strength, working time

Pins

- Tooth crazing
- Regular TMS .031” diameter .027” drill
- Minim: .024” w/ .021” drill
- Minikin: .019” w/ .017” drill
- Minuta: .0145” w/ .0135” drill

Dentin Bonding Agents

Why do we use them?

Amalgams

- Seals margins
  - Amalgam shrinks .07%

Composites

- Micro and macro mechanical bonding

Dentin Bonding Agents

- Bifunctional Molecule
  - bonds to both “water loving” dentin and “water hating” composite
  - HEMA, 4 META
- Hybrid Layer: interpenetrating network of resin & collagen

Amalgam Bonding

- All Bond 2 ®
- Single Bond®
- One Step®
- Resinomer®

Composites

- Resin
  - Matrix
    - BIS-GMA: Highly viscous but very soft
      - absorbs water
  - Matrix diluent
    - TEGDMA: Decreased viscosity but increased filler load
  - Fillers--ground quartz
    - the more filler, the less matrix, the better the physical properties

Composites

- Coupling agents
- Polymerization Activator
- UV absorbers
- Inhibitors
- Pigments
  - Titanium and Aluminum Oxide

Composites

- Particle Size
  - Macrofill
  - Hybrid: e.g. Prodigy®, Herculite® XRV
  - Microfill: e.g. Durafil®

Composites

- Clinical Factors
  - technique sensitive
  - isolation/moisture contamination
  - cavity prep-”C” factor
  - polymerization shrinkage
  - use with base or liner

Factors affecting the set of Composites

- Time
- intensity of light
- temperature
- distance
- resin thickness
- oxygen inhibition layer
- curing through tooth
- Shade of resin
- type of filler particle
- heat from curing light
- overhead fluorescent light

Microleakage

- Creates majority of the problems
  - post-op sensitivity
  - caries at margin
- Causes
  - hydrolysis of the bond
  - polymerization shrinkage
  - different (CTE: 30 vs 11) expansion rates

Glass Ionomers

- Glass--
  - powder
- Acid
  - --liquid

Glass Ionomers

- Conventional
- Resin Modified
  - light cured
    - Fuji II LC®
    - Vitrebond®

Sealants

- Moisture control
- cleaning tooth surface
- surface treatment
  - 37% etch 20 sec
  - 10 sec rinse & dry
  - bonding agent
- flow sealant into fissures
  - light cure min 20 sec
  - evaluate

Microabrasion

- 50 micron Al_2O_3 powder
- cleans preparation & fissures
- will create smear layer in dentin
- use for additional retention
- use to clean intaglio of crown

Bleach

- Hydrogen Peroxide: in office bleach
- Carbamide Peroxide: home bleach
- Sodium Perborate: walking tooth bleach
- Super Oxal 35% HP

Bleach

- Treat walking bleach cases with CaOH for 3 weeks before bonding composite

Fluorides

- 2% NaF
- 1.23%APF®
- Duraflor®
  - RD; Dry teeth; Apply (3X/ week); Let dry several minutes
- Gel-Kam® SnF
- Prevident® 1.1%NaF

Impression Trays

- Custom
- Stock
- Triple tray

Impression Materials

- Alginate: pour within 15 minutes
- VPS: pour after one hour < 7 days
  - Express®
- Polyether: pour < 7days; excellent moisture tolerance; stiffest material
  - Impregum ®
- Bite Registration
- Beware of bridges and bony eoxstoses

Hemostatic Liquids

- Hemodent--10% AlCl
- Astringident--10% FeSO4
- Hemotrol
- Visine--tetrahydrozyline

- use with knitted cords--2.5 X carrying capacity

Provisionals

- Jet® Acrylic
  - shrinkage
  - avoid moisture & contamination
  - strength
  - color stability